GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA

Monthly Progress Report

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EREP Investigation 380
Contract NAS-13394

Dr. Keenan Lee
Geology Department
Colorado School of Mines
Golden, Colorado 80401

Submitted to:

Mr. Martin Miller, Technical Monitor
Principal Investigations Management Office
Code TF6
Johnson Space Center
Houston, Texas 77058

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INTRODUCTION

The primary objective of the CSM Skylab Program is to analyze EREP data for geologic information. To this end, the research has been subdivided into the following tasks;

Task I. The PI shall assist NASA/MSC in mission planning activities related to the proposed investigation.

Task II. The investigator will screen all EREP data obtained over Colorado and will select frames for detailed study.

Task III. The investigator will prepare photogeologic maps using selected S-190 photographs, and will analyze them to determine what geologic information may be contained in them.

Task IV. The geological interpretations obtained in Task 3 will be compared to interpretations obtained from S-192 imagery, and to interpretations made from ERTS-I imagery.

Task V. The geological interpretations will be verified by means of interpretation of aerial photographs, published geological reports, and field observations.

Task VI. The investigator will prepare recommendations for the optimum type, scale, and resolution of imagery to be used for studies of regional geology and exploration for mineral deposits and water resources.

PROGRESS

Overall Status

With this report, Milestones 1 through 8 have been achieved, with the exception of Milestones 5 and 6. The project is behind schedule because of lack of data (see "Outlook and Recommendations").

Past Month's Activities

Work continued on the compilation of the Bonanza Test Site geologic map (about 70% complete) and the geologic map and report on the Regional Geology Test Site (about 95% complete).

Interpretation of high-altitude photography for EREP evaluation continued. Horizontally controlled photogeologic maps (scale = 1:100,000) are being prepared for the southern Front Range and for eastern South Park. Structures and other linears are the primary mapped features. This is being done in preparation for interpretation of scenes from Skylab 2 S190A Track 48. In addition, planning continued for a high altitude underflight of Skylab 4 in November in the two above mentioned areas. These flights will acquire low sun-angle black-and-white IR photography on a 9" x 9" format. These flights are designed to display shadow-enhanced structural features.

During October, a preliminary evaluation of the available Skylab photography along Tracks 34 and 48 was conducted, with the following conclusions:

1. Ability to discriminate and identify:
   a. S190A (both tracks), 70mm format, dupe pos.
   - Discrimination: can discriminate 2-lane paved highway, width approx. 30 ft. Example: Hwy 550 north of Durango, frames 15-17, rolls 7, 8, 11, and 12, Track 34.
   - Identification: can identify islands, approx. 300 ft. diameter, in Lake Electra, approx. 3000 ft. dia. Area is north of Durango (see Durango Quad, 1:250,000), frames 15-17, rolls 7, 8, 11, and 12, Track 34. Another example: can

easily identify both parts of the Twin Lakes Reservoir (smaller lobe is approx. 5000 ft. dia) in the Arkansas River valley, frame 16, rolls 13, 14, 17, and 18, Track 48.

b. S190B (Track 34), 4½ inch format, contact transparency.

- Discrimination: can discriminate unimproved logging roads (approx. 15 feet wide), clusters of buildings in town, large building (noise?) in field. Example: Durango area, frames 21-22, roll 81, Track 34.

2. Overall quality of photography:

a. S190A, Track 34

- Every frame has less than 20% cloud cover.
- Every frame has snow that degrades film quality.

b. S190A, Track 48

- 13 out of 18 frames have 0-20% cloud cover.
- 3 out of 18 frames have 20-40% cloud cover.
- 2 out of 18 frames have 40-60% cloud cover.
- 8 out of 18 frames have snow that enhances film quality.
- 1 frame has snow that degrades film quality.

c. S190B, Track 34

- Every frame has less than 20% cloud cover.
- 11 out of 12 frames have snow that degrade film quality.
- 1 frame has snow that enhances quality.

3. Optimum viewing band for S190A

a. Best resolution and contrast is roll 11 (>600nm - red)

b. Next best is roll 12 (490-600 green)

c. Rolls 7 (700-830nm - Infrared) and 8 (>790nm - Infrared) are very grainy, have low contrast, low resolution.

Preliminary studies on mineral deposits applications centered on interpretations of ERTS imagery, as a prelude to using EREP data. Location of the volcanic centers of Stoney Mtn., Silverton and Lake City calderas was done on the ERTS imagery of the scale 1:1,000,000. The multispectral scanner was utilized (1) to locate the clustered volcanic centers and associated caldera, (2) to view and locate the most dominant fracture systems tectogenetically related to associated caldera development, (3) to

relate dominant fracture systems of (2) above metallogenetically both to caldera centers as well as to strength and spatial distribution of mineral deposits of base metal type within these structural domains, and (4) to view and locate linear tectonic trends of Paleozoic and Mesozoic age, the ancient intersections of which may have localized development, rise and emplacement of the Early, Middle and Late Tertiary volcanic centers. Presumably plutonic bodies are present at depth beneath these volcanic centers and/or calderas.

Planned Activities for Current Month

Plans for November are to continue the Bonanza geologic map compilation, the preliminary examination of new Skylab photographs, and to select a suitable test site for geologic evaluation of Skylab photographs.

Interpretation of Skylab imagery will begin following receipt of useful products, and data will be analyzed for resolution, discrimination, and identification capabilities.

Travel

There was no travel during October.

Anticipated travel during November consists of one trip by the PI to NASA/JSC for Skylab data screening.

Outlook and Recommendations

As reported last month, Milestones 5 and 6 were not achieved because of lack of receipt of data. Based on recent contacts with PIMO, it is probably that these objectives will not be met in November either. The effect of the delays in receiving data, of course, will be even more far-reaching in terms of our over-all objectives.

Keenan Lee
Principal Investigator